International Journal of Management, Social Sciences, Peace and Conflict Studies (IJMSSPCS), Vol.5 No.3 September, 2022; p.g. 487- 497; ISSN: 2682-6135

TRAINING PROGRAMMES AS A TOOL FOR EFFECTIVE TEACHING OF SECONDARY SCHOOL PHYSICS IN THE 21ST CENTURY

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Abstract

This research work aimed to investigate teachers' training programmes as a tool for effective teaching of secondary school physics in the 21st century. The design of the study was descriptive survey design The researchers adopted the use of Teacher Report Form (TRF) to collect data from two hundred and forty (240) secondary school physics teachers drawn from 48 secondary schools in Federal Capital Territory Abuja, using multi-stage random sampling technique. Two research questions and one null hypothesis guided the study. Data collected were analyzed using simple mean and t-test statistic. The result of the study showed that secondary school physics students taught by teachers exposed to training programmes had high leaning achievement score than their counterparts taught by physics teachers un-exposed to training programmes who showed average moderate academic achievement. Thus, the researchers concluded that Teachers exposed to in-service training are more effective than their counterparts who are not exposed to training programmes. Secondly, training programmes for physics teachers increase physics students' academic achievement and thirdly, that Teacher training programmes have positive influence on the academic achievement of physics students. The researchers, thus, recommended that: Government at all levels should be more proactive in the provision of adequate training programmes for secondary school physics teachers in Nigeria; and that training programmes for physics teachers should be made a routine and mandatory exercise from time to time for every physics teacher both private and public secondary school teachers among others.

Keywords: Training programmes, Secondary schools, Physics, 21st century.

Introduction

In the recently, specifically in the in the last decade till date, teaching and learning has witnessed great innovations, while traditional way of learning is giving way. Presently in the 21st century, leaning is no longer restricted to the traditional method of direct contact of the learner and the teacher at a given place called classroom. Hence, teacher education which is part of the education process or training that deals with the art of acquiring skills used in teaching profession is no longer enough grantee of the effectiveness of the teachers who are faced with day to day modification and inventions occasioned by dynamism of 21st century powered by information technology. Thus, this has given room to training programmes. Training programmes comprise all formal and informal programmes aimed at increasing the skills, technical- know- how, capacity and efficacy of an individual towards achieving a given goal.

Teachers training programme therefore include various exercises: pre- service and in-service that influences the skills of learning and teaching, and helps teachers to grow and develop the skills and professional abilities to motivate children to learn. In Nigeria, teacher education is accomplished through Colleges of Education, Faculties of Education of various Universities and at specially designed teacher education institutions. Teacher education includes both the initial education and continuing education in the form of in-service training and professional development programmes geared towards equipping teachers for effective teaching through providing them with the platform to acquire the understanding of concepts, values and attitudes needed for the classroom (Lawal, 2003). Isyaku (2000) opined that the teacher is the carrier of culture of the society and the agent of its perpetuation and renewal as well as the architect of its change for the better. Recently, the decision of Nigeria to advance in science and technology has created more challenge in the teaching profession. Some teachers find it difficult to cope or fit in with the skills, quality and ability required for effective implementation of the new Nigeria secondary school physics curriculum.

Secondary school physics is a body of knowledge and learning experience selected to prepare recipients with the basic knowledge and skills to appreciate science, nature and to cope with the requirements for further studies for specialization in any of the science related disciplines; like medicine, health, engineering, technology among others. Secondary school physics is therefore one of the most important science subjects in the secondary school science curriculum for its roles in preparing feature scientist, technologists, engineers, medicals and health personnel of the nation. Given the important of physics subject at the secondary level of education, students' understanding of the subject is very necessary. Hence the students' understanding, mastery and achievement in physics is to a large extent dependent on quality of the teachers; skills and compliance to innovations in teaching and learning in the 21st century.

21st century is characterized by Information Communication and Technology powered by the internet which has brought the world into a global village, dynamism the other of the day. Traditional methods or approaches to teaching has been challenged while the increase in the body of knowledge, use of technology in education makes the teacher a continuous learner. Thus, speculation has it that continuous studies or training, not only improves the ability of teachers, but keeps the teacher informed and abreast to innovation in teaching. For instance, if a teacher fails to update himself with the rapid scientific and educational developments, the teacher would become obsolete, inefficient and ineffective in carrying out the required pedagogical roles. National Education Policy (2014), indicated that "the teacher is considered the most crucial factor in implementing all instructional reforms at the grassroots level. He hence, requires conscious efforts to meet up with the trend of modernization, technological advancement and innovations characterizing the 21st century.

It is expected that the academic qualifications, knowledge of the subject matter, competence and skills of teaching and the commitment of the teacher will have effective impact on the teaching and learning process. The report of Commission on National Education (1959) has similar statement as "we say it with force and without reservation that none of the reforms we are proposing will succeed unless we are able to recruit to the teaching profession at all levels men and woman of the highest abilities, and can train them." In line with the aforesaid,

teacher needs training from time to time to be effective in teaching and learning. Many factors are responsible for shaping the quality of teaching. These include ideological and socio-economic needs, existing structure of education system, and well-defined theories and practices of teaching and learning. Teacher education programme, being an integral part of the education system, has greatly expanded for catering for the need for teachers in the country. However, teacher education programme faces limitation posed by dynamism of 21st century which have made it difficult for some teachers to cope with the recent demand of teaching and learning.

Teachers are nations' great assets. It is the quality of teachers on which the population of a country mainly depends for excellence. Teachers' credibility depends on how they take up the rights and responsibilities (Nye, Spyros & Larry, 2011). A teacher should be a guide not a dictator, an artist not a mechanic, a scholar and a philosopher not a collector and repeater of facts. The above discussion revealed that training of teachers is crucial for teachers to adjust to innovations in teaching and learning. In the context of this study, training refers to a process designed to enhance the professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of the learner. Training is an important part of teacher preparation programmes, especially for those aspects of teaching that are more skill-like in their conception, but there are many other important aspects of teaching that can only be nurtured through reflective strategies and experiences.

Training teachers is more likely to lead to diversity in practice at all levels of instruction. According to Ayo (2004), there are several outcome areas that are potentially affected by teacher training programme. These include: Teacher knowledge, Teacher attitudes and beliefs, Teaching practice, School-level practice, and Student achievement. The responsibility of training teachers lies on the shoulders of teacher educators. Teacher educators are usually faced with five major tasks in preparing new teachers or helping experienced teachers become better. These tasks are determinants of the curriculum content to teach student teachers, methods to use in preparing student teachers, motivating teachers to learn, assessing teachers' learning, and dealing with individual differences among student teachers. Hence, teacher training and professional development often include imparting knowledge about content and skills in instruction, classroom management, or assessment, and developing teacher knowledge and skill. It enables teachers to reflect critically on their practice and approach new knowledge and beliefs about content, pedagogy, and learners.

One of the major Purposes of training is to generate the conditions that enable the practice to be selected and used appropriately. There are many critical elements in teacher training that should be given due attention. Ayo (2004) have summarized the findings from the literature on training in terms of the following critical elements of teacher training. Trained teachers are expected to establish clear performance goals and communicate them to learners. They should determine learners' present skill level, and ensure that learners are aware of the requisite skill level of mastery; Introduce only a few basic rules during early learning stages; build upon learners' present skill level during early learning stages. To ensure a basic understanding of the skill to be learned, and when and why it is used; provide sufficient, spaced skill practice after understanding has been developed and that practice of the skill is followed by knowledge of the results; provide frequent knowledge of the results in the learning process

and after incorrect performance; Provide for transfer of training and provide full support and reinforcement for the use of skills in natural settings. Training of teachers provides them with knowledge, skill, and ability that are relevant to the professional life of a teacher. Teacher training molds the personality of a teacher such that their attitudes are reshaped, their habits are reformed and their personality is reconstituted through teachers training.

Federal ministry of education in Nigeria reorganizes two types of teacher training. Thus, teacher training is classified into two: Pre-service training and in-service training. Pre-service training is the training provided before employment of teachers and is generally a pre requisite for employment. It is aimed at professional growth of the teacher and is planned and provided in such a way that it leads to the development in teacher positive attitude towards education and towards improving his own performance in terms of better student learning. The description of various training programmess is in line with the National Education policy (1998-2010). Some other types of teacher training programmes are also being conducted. These include: Diploma in education model, B Ed. While many universities are providing courses at M.sc in education and Ph.D level, many institutions and universities are involved in providing these training to teachers. Pre service training is an essential prerequisite for teaching in all level of education in the country.

However, training programmes is the main focus of this study. Training programmes in the context of this study refers to all forms of in- service programmes under go by teachers after their pre- qualification training. In view of the operational definition above, training programmes is synonymous to in- service training and in some cases may be used interchangeably. It is referred to an ongoing process that goes on continuously throughout the educational life of a teacher. As one does not finish learning with graduation, likewise the teacher's training goes on improving with the passage of time by gaining experience and study through-out the life span of a teacher. It is a means to achieve educational change that will persist. Training programmes refers to all those activities that contribute to professional growth and qualifications of an employee e.g. reading educational generals, participating workshops, seminars, conferences and visits to educational institutions that give the employee a sense of security and a feeling of self-confidence while discharging his routine duties in the school. It is a continuing education of teachers and other educational workers leading to the improvement of their professional competence.

With the recent dynamism in education especially at secondary school level as a result of rapid increase in human knowledge and increase in the functions expected of the secondary education giving the challenges and changes of the 21st century; new approaches, new methods of teaching, and new avenues for the teachers are being introduced. It calls for teachers to keep themselves abreast with new developments in teaching to be efficient. In order to achieve this end, it is necessary that a great many opportunities of training programmes should be provided for teachers. Different techniques of training programmes as indicated in a report by Government of New Zealand (2000) included:

- Refresher courses: as suggested from the name 'refresher' to give strength or vigor to the efficiency and output of the already employed teacher. These courses are of high value regarding the achievement of familiarizing teachers with the tests and

techniques of test and measurement, familiarizing them with the educational plans and programmes.

- Workshops: Workshop is a period of discussion and practical work on a particular topic/subject, when groups of people share their knowledge and experiences. The members of the workshop discuss and exchange views on a certain issue. The duration of the workshop may be from three to ten days depending upon the gravity of the problem.
- Seminars: In seminars small group of people meet to discuss a topic and each participant has the opportunity to gain knowledge and experience.
- Conference: Conference is a meeting for discussion or exchange of views. Usually the conference of teachers, principals, supervisors and administrators can broaden their professional horizons and cultivate in the participant members a professional team spirit.
- Lectures: Lecture is an oral activity, the simplest of ways practiced for in-service education and teachers' re-orientation programs. Lecture is suitable particularly for transmission of knowledge.
- Study Circle: It is one of the desirable techniques of the in-service education. In this method the teachers of a particular subject have a meeting and in this meeting they discuss the ways and means of teaching a particular subject.
- Correspondence courses: This is very effective method for the in-service education. With these courses teachers can improve their profession knowledge. Science club: This is a technique of in-service education for the science teachers. The science teachers are given instructions in these science clubs to promote their understanding and the capacity of educating the young.
- Publications: Teachers may write on certain topics of general interest for the teachers. With this method they communicate their personal experiences. The school may publish the material or the abstract of certain useful research for the benefit of the teachers
- Vacation institutes: These institutions are of high value for teachers for many reasons firstly because they enrich teachers' treasury of knowledge and the teachers return to the school with renewed spirit. Secondly they make full use of the vacation in a better way and thirdly because the teachers have the opportunity of enjoying the life of studentship.
- Demonstrations: This is an activity pre-arranged for the observation of the group. The demonstrator is usually a skillful expert of the field being demonstrated. Efforts should be made to make the demonstration genuine and natural so that artificiality could be avoided. Demonstration may be used for workshop or any other course of study where knowledge and skill is being improved. After the demonstration, a follow up is made.
- Project group: Project group is used in those occasions where the accomplishment of a specific project is to be carried out. The project group usually makes survey of the project assignment and develops a course of study.
- Field trip: Field trips are used to provide an opportunity to the in-service teacher to see the activities of his field. Field trips may be carried out inland and abroad.
- Panel's presentation: A panel is a technique in which two persons speak on a single topic. Panel presentation can be of any of the following types

- Debate, symposium, informal panel: Debate is an organized form of the panel in which stress is laid on the facts and ideas and the group observes the same. Symposium is a series of brief presentations made by a series of persons to the group, while spontaneity is the conspicuous feature of informal panel. A number of speakers speak on the topic in informal panel.
- Film: Presentation of film is also a very useful technique of in –service education and training. An ideal film presentation is when associated with discussion.

Other techniques include visits of teacher to another teacher in action, directed practice and activities and extension lecture, exhibition, action research and self-reading by individual teacher can also be used.

It is a well-known fact that the quality of education system of a country depends upon the academic and professional qualification of teachers of that country. While the professional qualification of teachers is dependent on training to produce qualitative manpower, which becomes a reliable source of effective teaching learning process. Teachers, need various tools to become successful in effective teaching. Douglas and Tim (2007), identified three main factors within teachers' control that significantly influence students' progress. These are:

- Teaching skills: These are those behaviours that the effective teacher constantly exhibits when teaching a class. These include involving all students in the lesson, using a variety of activities or learning methods, applying appropriate teaching methods, and using a variety of questioning techniques to probe students' knowledge and understanding.
- Professional characteristics: These refer to teachers' personality, character, qualification, training, knowledge and skills etc. Teacher's personality is central to learning how to teach better. Qualifications and training alone do not make a good teacher. Personality, character and commitment are as important as the specific knowledge and skills that are used in the daily tasks of teaching.
- Classroom climate: It is a measure of the collective perceptions of pupils regarding those dimensions of the classroom environment that have a direct impact on their capacity and motivation to learn.

Clotfelter, Helen and Jacob (2006) observed that marginal increases in-service training have statistically or academically significant effect on either Reading or Math achievement, suggesting that modest investments in staff development may not be sufficient to increase the achievement of elementary school children in high poverty schools. In view of the relevant literature review in this study, it was deduced that pre-service training, grade point average (GPA) and qualifications of teachers have little or no impact on the academic achievement of students.

Statement of the Problem

The demand of education in the 21st century is complex, some teachers may find it difficult to cope with difficulties occasioned by social change and innovations in teaching and learning associated with this era. Though, the national policy on education (2014) mandated only teachers with good educational academic qualification to teach at all levels of education. Evidence abound that emphases are laid on pre- service teacher training with low attention to

in- service teacher training as a way out of present and future classroom needs. Little efforts are made to encourage periodical training and retraining of teachers to explore new methods, ideas and innovation in teaching for effective teaching of the child. This may have impact on the attainment of primary school objective in the dynamic education of the 21st century in Nigeria, and the learners' academic achievement. In developing nations of the world like Nigeria, the conventional method of teaching is under strong attack by the introduction of Integrated Circuit Technology (ICT), and other features of technologically induced changes in teaching. Coupled with the dynamism of the 21st century where conventional method of doing things is gradually going into extinction, observation has it that teacher education has little or no flexibility to accommodate the continue changes in the method, content and multiple functions of education in this era. Hence, the researcher speculates training programmes as tool for effective teaching of secondary school physics in the 21st century which this study tents to empirically verify.

Purpose of Study

The purpose of this study was to investigate the impact of training programmes (in-service teacher training) on secondary school physics students' academic achievement. Specifically, the study sought to:

1. determine the learning achievement mean scores of physics students taught by teachers exposed to training programmes.
2. determine the learning achievement mean scores of physics students taught by teachers, unexposed to training programmes.
3. Asses the influence of training programmes on the academic achievement of physics students

Research Questions

The following research questions were posed to guide the study:

1. What is the learning achievement mean scores of physics students taught by teachers exposed to training programmes?
   What is the learning achievement mean scores of physics students taught by teachers unexposed to training programmes?

Hypothesis: one null hypothesis was formulated for the study

Ho1: there is no significant difference between the academic learning achievement mean scores of physics students taught by teachers exposed to training programmes and those taught by teachers unexposed to training programmes at 0.05 level of significance.

Methodology

Design

The investigation employed descriptive survey research design. This design was very suitable for this study as the study involves collecting, analyzing, interpreting and reporting of data collected from classroom teachers on the academic achievement of secondary schools physics students taught by teachers exposed to in-service training and those taught by teachers unexposed to training programmes.

Sample and sampling procedure

The sample size of the study comprised 48 secondary schools, 240 secondary schools physics teachers and 4260 pupils. A multi-stage random sampling technique was employed for selection of the respondents. In the 1st stage, stratified random sampling techniques was employed to draw 24 public secondary schools and 24 private secondary schools in the Federal Capital Territory amounting to a total of 48 secondary schools. At the second stage, purposive sampling techniques was used to select all the secondary school physics teachers in each of the sampled secondary schools teaching SS1, SS2 and SS3 and secondary schools physics students taught by the sampled class teachers drawn from the sampled schools amounted to 4260 physics students used for the study.

Instrumentation

The instrument used for data collection was a proforma titled: Teacher Report Form (TRF) developed by the researcher. The instrument was divided into two major parts. Part A sought information on the demographic characteristics of the respondents including the number of seminars or workshop and other in-service training on teaching and learning attended by the teacher with dates. Part B of the instrument was structured to seek for 2020/2021 sessional average or cumulative average score of physics students per class (SS 1-3) among the sampled schools.

Method of Data Analysis

The data obtained from the respondents (teachers) were used to answer the research questions. Simple descriptive statistics of simple Mean was used to answer the research questions t-test statistics was used to test the hypothesis at 0.05 level of significance.

Research Question One:

What is the learning achievement mean scores of physics students taught by teachers exposed to training programmes?

Table 1: ***The learning achievement mean scores of physics students taught by teachers exposed to training programmesin 2020/2021 academic session***

Class (SS)	**Academic session**	**No. of teachers exposed to training programmes per class**	**Class Cumulative average achievement score in physics**	**Learning achievement mean score of pupils taught by teachers exposed to in-service training**
1	2020/2021	35	68.60	
2	2020/2021	37	69.70	
3	2020/2021	39	71.50	
TOTAL		**111**	**209.80**	**69.93**

The summary of the result presented in table 1 reveals the class (SS1-3) cumulative learning achievement mean scores of SS1, SS2, and SS3 physics students, taught by physics teachers exposed to training programmes across the sampled secondary schools. Thus the table

revealed that the grand mean class achievement score of physics students taught by teachers exposed to training programmes was 69.93 in 2020/2021 academic session.

Research question Two

What is the learning achievement mean scores of physics students taught by teachers unexposed to training programmes?

Table 2: ***The learning achievement mean scores of physics students taught by teachers unexposed to training programmes in 2020/2021 academic session***

Class (SS)	Academic session	No. of teachers exposed to training programmes per class	Class Cumulative average achievement score in physics	Learning achievement mean score of pupils taught by teachers exposed to in-service training
1	2020/2021	45	57.20	
2	2020/2021	43	59.40	
3	2020/2021	41	61.39	
TOTAL		**129**	**177.99**	**59.33**

The summary of result presented in table 2 shows the class (SS1-3) cumulative learning achievement mean scores of SS1, SS2, and SS3 physics students taught by physics teachers unexposed to training programmes across the sampled secondary schools were 57.20, 59.40, and 61.39 respectively. Thus, the table further revealed that the grand mean class achievement score of physics students taught by teachers unexposed to training programmes was 59.33 in 2020/2021 academic session.

Hypothesis one:

Ho1: there is no significant difference between the academic learning achievement mean scores of physics students taught by teachers exposed to training programmes and those taught by teachers unexposed to training programmes at 0.05 level of significance

Table 3; t-test Analysis of the Significant Difference between the learning achievement mean scores of secondary school physics students taught by teachers exposed to training programmes and those taught teachers unexposed at 0.05 level of significance

Physics teachers' training status	N	Mean	SD	Df	t- cal	Sign	Dec
Exposed to training programmes	111	209.80	2.52	238	4.405	0.000*	Significant (reject H_o)
unexposed to training programmes	129	177.99	2.95				

Key: N=Number of test respondent, = Mean score, sign= Significant value

*** Significant at 0.05.**

From Table 3 above, given that (238= 4.405, p<0.05), it implies that there exists a statistical significant difference in learning achievement mean score of secondary school physics

students taught by physics teachers exposed to training programmes and those taught by physics teachers that were not exposed to training programmes. Hence, the null hypothesis is rejected.

Discussion of Findings

The results of the present study have shown that there is need for adequate and effective training programmes for physics teacher in secondary school level of education for maximum academic achievement of physics students and secondary school physics objective in the contemporary Nigerian society driven by innovations and technology. It further informed that emphasis on employing qualified physics teachers at the secondary school level by National Policy on Education (2014) without commensurate plans to acquaint the qualified teachers with the latest knowledge, ideas, new methods of teaching and some new topics introduced to secondary school physics curriculum is not enough for maximization of secondary school physics objective and academic achievement of physics students. It is against this background that Nworgu (2009) noted that most of the methods used today by teachers in teaching and learning do not stand the test of time of 21st century. This result is in agreement with the report of Zarnbo and Zarnbo (2008) that pre-service teacher training and having a Masters' level qualification together raise leaner's academic achievement by a small amount.

The grand mean achievement scores of physics students taught by teachers exposed to training programmes was significantly higher than their counterparts taught by teachers un-exposed to training programmes. This implies that secondary school physics taught by teachers exposed to training programmes exhibited high learning achievement as observed by organization theorist of Brimley and Garfield (2005), that the more complex educational demand becomes the greater the importance of teacher training programmes to meet the difficulties occasioned by demand of social change. Given that training programmes provide teachers with the needed and current professional skills to carry out effective teaching and learning of physics at the secondary school level.

Conclusion

The study has revealed that in general, physics students taught by teachers exposed to training programmes exhibited very high academic achievement, while pupils taught by teachers un-exposed to training programmes exhibited moderate academic achievement. Given the findings, the study concluded that teachers exposed to training programmes are more effective than their counterparts who are not exposed. Therefore, training programmes for teachers increases academic achievement. In addition, teacher has training programmes has positive influence on the academic achievement of physics students.

Recommendations

Based on the findings of the study, the following recommendations are made.

1. Government at all level should be more proactive in the provision of planned training for secondary school physics teachers in Nigeria.
2. Training programmes for secondary school physics teachers should be made a routine exercise and mandatory for every physics teacher in both private and public secondary schools.

3. The government and its agency should establish continuous Teacher Training Scheme (CTTS) which should be faced with the responsibility of planning training programmes in a way that every teacher will benefit from it including private school teacher who are often left to bear the burdens of their training programmes.

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